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Lawrence Livermore National Laboratory Security Category I/II Special Nuclear Material De-Inventory Status

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Disclaimer

Lawrence Livermore National Laboratory Security Category I/II SNM De-Inventory Status

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Background

Lawrence Livermore National Laboratory (LLNL) is in the process of reducing the amount of Special Nuclear Materials (SNM) to below the Security Category I/II levels at the Plutonium Facility. This action has been taken as part of the National Nuclear Security Administration (NNSA) "Complex Transformation" effort. The NNSA Administrator. Thomas D'Agostino has defined "Complex Transformation" as NNSA's vision for a smaller, safer, more secure, and less expensive nuclear weapons complex that leverages the scientific and technical capabilities of the workforce and meets national security requirements. Part of Complex Transformation entails reducing or eliminating SNM storage at certain sites and consolidating materials and Security Category I/II operations at a minimal number of sites. LLNL has developed a plan to de-inventory to a Security Category III level by October 1, 2012. Security Level III means that there will be less than 400 grams of plutonium metal.

Current Status

Most of LLNL's nuclear material inventory will be declared excess to program mission by 2012. Approximately 87% of LLNL's inventory as of October 2006 will be declared excess to NNSA missions at the completion of this effort. The excess materials will be transferred to other sites for consolidation and future disposition. These materials will be shipped to other DOE Sites.

Mission effort and associated materials (about 13% of the starting inventory) are planned for transfer to LANL and other sites. LLNL continues to have active programmatic activities and will operate at a Security Category III level after 2012 in support of NNSA missions.

LLNL's current inventory predominantly consists of weapons grade nuclear materials. The makeup of the current inventory (April 16, 2010) is about:

12% depleted uranium (U) (<0.7% ^{235}U),
1% natural U (0.7 ^{235}U),
3% enriched U (0.9-20% ^{235}U),
31% highly enriched U (>20% ^{235}U),
48% plutonium,
0.1% Neptunium,
1% Thorium and
4% other.

The inventory contains 77% metal, 16% non-metal and 7% waste.

Processing and Shipping

There are about 1700 items that need to be stabilized for transportation and long term storage. The kinds of materials to be processed include metals, oxides, salts and other compounds. The kinds of operations that need to be performed include:

- Salt scrub to remove SNM from the salts,
- Calcining to convert small metals and fines to oxide,
- Consolidation to combine metal,
- Loss on Ignition to stabilize oxides,
- Canning the items in preparation for packaging, and
- Packaging into shipping containers

The canning operations are used to prepare the material for packaging. Materials will be canned into crimp sealed food pack cans, DOE Standard 3013 containers (3013), conflat sealed containers and special forms capsules. The 3013 containers are a robust double welded container that is designed for 50-year storage. The containers are limited to less than 4.4 kg of plutonium and uranium and no organics. Metals canned into the 3013 containers cannot have any loose oxides and each piece must be larger than 50 grams. Oxides need to be calcined at greater than 950C and have a moisture content of less than 0.5wt%.

LLNL will be using a number of shipping packages to send materials to different sites. The shipping packages planned to be used are DOE Model 9975, 9977, 9978 and DPP-2s. Most of

the material will be shipped in the DOE Model 9975 shipping packages (9975). This container will hold most of the crimp sealed food pack cans and the 3013s. The 9977s and 9978s will be used for some of materials that can't be shipped in the 9975s. The DPP-2s will be used to ship larger items.

A processing plan and schedule have been developed to determine what is needed to meet the October 2012 completion date and to monitor our progress against. The schedule was developed by examining each of the processing steps needed for each type of material to develop processing lines. These processing lines were linked together based on how much of each material there is to develop a schedule. The schedule includes several important assumptions including: the time to perform each operation based on historical data, actual operations, and communications with the operators. The schedule also took into account the operating calendar including working 4 days/week, holidays and known facility "shutdowns" such as inventory and maintenance requirements. Then this schedule was modified based on actual processing data.

Lesson Learned

As LLNL has been processing and shipping off material a number of lessons have been learned that would be useful to share.

Watch the fine print. You need to be careful in selecting the shipping package and content envelope to be used. Many of the shipping package contents have been created for a specific set of materials. Even though you may have similar materials you need to ship, make sure you read all of the information in the shipping package Safety Analysis Report for Packaging (SARP) to verify that you can send it. As an example we have neptunium to be shipped and the 9975 content envelope C.8 covers neptunium. Unfortunately there are a number of other restrictions including how the material is made, the container that can be used, and the type of gas to inert the can and package. These conditions are specific to the particular use that the content envelope was developed for. So LLNL will require special permission to use that content envelope for our neptunium.

Do not get too close to the limits. The shipping packages have various restrictions. If you get too close to them you may not be able to use the shipping package. As an example, LLNL filled a 3013 can to 4.996 kg when the 9975 limit is 5.0 kg. The receiver site required that the uncertainty be included in the weight calculations. This resulted in the can being at 5.0006 kg and we had to request an amendment to the requirement before shipping this item.

Multiple Requirements Documents. There can be multiple documents that place requirements on a particular item and they may be inconsistent. As an example, The DOE-3013-Standard controls what is packaged in a 3013 container. The 9975 shipping package was designed for shipping 3013 cans. But the 9975 SARP also controls what can be shipped in a 3013 container. Unfortunately, the 9975 requirements are more restrictive than the 3013 requirements. This resulted in a number of 3013s being unshippable. LLNL worked with the 9975 SARP personnel to develop content envelops that are more inclusive.

Watch for the unmentioned. When working with receiver sites be aware that they may have a number of site-specific restrictions. You should ensure that any site requirements be provided in writing so that the requirements are clear between both parties.

Be sure you can live by your own rules. There have been a number of times that we have developed procedures for performing work and find out later that we have limited our flexibility by developing overly restricted rules.

Conclusions

The de-inventory effort is proceeding as planned. Criticality and shielding aspects of this effort will be discussed at the meeting.

Auspices Statement

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